

## PRECIPITATION.

The average precipitation for California for June with departures from the normal is as follows:

Year.	Mean.	De- par- ture.	Year.	Mean.	De- par- ture.
	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
1897.....	0.46	+0.15	1905.....	0.07	-0.24
1898.....	.25	- .06	1906.....	1.05	+ .74
1899.....	.57	+ .26	1907.....	1.02	+ .71
1900.....	.19	- .12	1908.....	.17	- .14
1901.....	.01	- .30	1909.....	.19	- .12
1902.....	.10	- .20	1910.....	.05	- .26
1903.....	.07	- .24	1911.....	.15	- .16
1904.....	.04	- .27	1912.....	.49	+ .18

The greatest monthly precipitation was 2.80 inches at Edgewood, or 1.50 inches more than the heaviest monthly amount reported during June, 1911. At 63 stations there was no rain during the month.

## SNOWFALL IN THE MOUNTAINS.

The snowfall was light during June. Only patches of snow remained on ground at high levels after the 7th and the snow cover may be said to have disappeared at the end of the first week. On the 23d there was a fall of about 1 inch, but this disappeared within 24 hours.

## SUNSHINE.

The following table gives the total hours of sunshine and percentages of the possible:

Stations.	Hours.	Per- centage of pos- sible.	Stations.	Hours.	Per- centage of pos- sible.
Eureka.....	164	36	Sacramento.....	329	74
Fresno.....	403	92	San Diego.....	245	57
Los Angeles.....	291	68	San Francisco.....	301	68
Mount Tamalpais.....	273	62	San Jose.....	351	80
Red Bluff.....	328	73	San Luis Obispo.....	299	69

There was less sunshine during the current June than during June last year and much less than during June, 1910.

## NOTES ON THE RIVERS OF THE SACRAMENTO AND LOWER SAN JOAQUIN WATERSHEDS DURING JUNE, 1912.

By N. R. Taylor, Local Forecaster.

*Sacramento watershed.*—The average stages of all streams in this watershed were much below those usually maintained during the month of June. In no case, however, were the rivers as low as during the corresponding month in 1910.

The upper Sacramento River remained practically stationary, but from Colusa to Walnut Grove the river fell steadily during the entire month, the ranges between the stages of the first and last dates being 7.1, 8.2, and 7.8 feet, respectively, at Colusa, Knights Landing, and Sacramento City.

Some rain fell during the month in the drainage basins of all streams, but with the exception of the American River at Folsom, which rose slightly over 2 feet during the 24 hours ending at 7 a. m. of the 13th, the rainfall had little effect on stream flow.

*Lower San Joaquin watershed.*—The rivers of this watershed averaged from 1 foot to over 3 feet below the normal for the month. There was a notable absence of the usual June freshets.

Melting snow slightly increased the run-off of the tributaries of the San Joaquin during the first few days of the month and resulted in a noticeable swell in this river during the latter part of the first decade, otherwise the effect of snow water was not apparent. By the middle of the month a general fall was in progress throughout the lower San Joaquin drainage basin.

Conditions now indicate that the extreme low-water stages will be reached much earlier than usual in this watershed.

## NOTES ON THE STREAMS OF THE UPPER SAN JOAQUIN WATERSHED.

By W. E. Bonnett, Local Forecaster.

A somewhat better stage of water was maintained in the streams of the upper San Joaquin watershed during June than the low stages of May indicated as being probable. Of the six years' record, the stages for May, 1912, were the lowest with the one exception of May, 1908, while the June stages this year are higher than those of 1908 and 1910 also. However, the excess over the mean stages of 1910 is not considerable.

The mean of the daily gage readings at Merced Falls for June was 1.7 feet as compared with a six-year average of 2.1 feet, the daily stages ranging from 3.1 feet on the 3d and 4th to 0.7 foot on the 30th. At Friant on the San Joaquin the mean daily stage was 2.6 feet as compared with a six-year average of 4 feet. The extreme stages of 5 feet and 0.7 foot occurred on the same dates as at Merced Falls. At Firebaugh the mean monthly stage was 5.9 feet as compared with an average of 8 feet, 2.4 feet in 1908 and 4.8 feet in 1910. In the Kings River at Piedra the daily stages ranged from 12.2 feet on the 3d and 4th to 6.3 feet on the last day of the month, with a mean stage of 9.1 feet.

## WEATHER AT POINT REYES LIGHT, CAL., DURING JUNE, 1912.

By James Jones, Observer.

The meteorological feature of the month was the record-breaking rain storm of June 23 and 24. A total of 1.49 inches fell during this storm, and 1.27 inches fell within a 24-hour period. Not only is this the heaviest 24-hour rainfall ever recorded here in June, but it is also the heaviest in any month since February, 1909.

## PRESERVING MAMME CAPRIFIGS FROM FROST.

By G. P. Rixford.

The following article is an extract from an exhaustive paper on Recent investigations in fig culture and caprifigification, read by Mr. Rixford at the Fruit Growers' Convention, held at Santa Barbara, Cal., May, 1912. Only that portion relating to frost is given.

*Dependence on the Blastophaga.*—Everybody knows that the Smyrna fig industry is absolutely dependent on the blastophaga which carries the pollen grains from the stamens of the profichi caprifig to the pistillate flowers of the Smyrna fig. The preservation of the insect through the winter is therefore of paramount importance.

The severe frosts of the past winter proved very disastrous to the mamme crop, as well as to thousands of young trees throughout almost the whole of California and Arizona. First, abnormally low temperatures in November, prematurely defoliated the trees and left the figs exposed unusually early; then scanty rainfall during the fall and early winter reduced the vitality of the trees and was a further contributory

cause of injury. In the San Joaquin Valley the usual tule fog, which is a great protector against frost, was lacking. Most of the injury was done by the drop in December to 17° at Yuma, Mecca, Indio, Riverside, San Bernardino, Fresno, and so on north to Yuba City and Chico. In normal seasons young fig trees and the mamme crop will endure a temperature of 17°, and probably lower, without injury. These conditions may not happen again in a generation, and yet bearing trees of 6 and 7 years of age suffered no loss of wood, the damage being confined to the winter crop of caprifigs.

*The best Capri trees.*—There are now established in California, thanks chiefly to the United States Department of Agriculture, probably more capri varieties than are to be found in any other country in the world. We have most of the best from the Smyrna district of Asia Minor, many from Italy, Greece, the islands of the Mediterranean, and especially from the States of northern Africa, besides a host of seedlings of local origin.

Probably every Smyrna fig grower has observed the difference that exists in the ability of different varieties to carry through the winter crop. Many kinds never produce a mamme crop, though they generally yield the profichi in great abundance. Still others produce so few that they are of little use in perpetuating the blastophaga. Quite a number fail to bear a mammoni or late summer crop, or the figs come at a time that leaves a hiatus in the successive generations. Such trees can not produce a mamme crop unless they have the assistance of better trees, for it is well known that the mamme figs dry up and fall unless oviposited in by wasps of the mammoni generation. It is a curious fact that the egg of the blastophaga is just as essential to the caprifig as is the pollen grain to the Smyrna fig.

Careful investigations extending over a period of several years seem to indicate that the ability of a tree to successfully support the mamme crop through the winter is more a question of variety than of climate. Several instances are known where, in frosty portions of the San Joaquin Valley, single trees, unassisted by others in the neighborhood, have carried the different crops uninterruptedly for more than 40 years. The possession of such trees by the grower is of supreme importance.

*Preserving Mamme caprifigs.*—After recommending a list of capri trees that when well established can be depended upon to carry the mamme figs through the severest winters yet experienced in California, it may seem superfluous to describe a process by which these winter figs can be stored, safe from not only California frosts, but from those of regions where the temperature goes so low as to render it impossible to carry the insect from year to year and consequently to grow Smyrna figs.

Of the three crops of the capri tree, the mamme is vastly the most important, as both the others depend for existence on the insects which live through the winter in this crop. We may, therefore, truthfully say that the whole Smyrna fig industry is actually dependent on the mamme, for failure of this crop means ruin to the others.

The severe frosts of the past winter emphasized the fact that every precaution must be taken to save the mamme crop. A good deal of experimenting has been done with this end in view. George C. Roeding has diminished the loss somewhat by building light shelters of palm leaves or other light material over the trees, mounted on a framework supported on four posts. Experience has shown that it is not best to rely on the roof alone, for much better results are had when the sheltering cover extends down to within three or four feet of the ground on the sides exposed to the morning sun, so as to protect the figs, in case of frost, from too sudden thawing. This method, however, has been only partly effective. Another plan, tried by the writer, which has been fairly successful, is to cut from the tree in December, before the severe frosts, twigs bearing well-developed mamme and plant them in moist soil in the open air, leaving the figs above the surface. The branches should be planted where they would have some protection by trees or buildings from the severest frosts. In this way the caprifigs have been carried through the cool weather, and the insects issued in large numbers at the usual time in spring.

But another step has been taken in this direction by Henry Markarian, of Fresno, that deserves to rank as an important discovery. On the 5th of April last, at his place near Fresno, he handed the writer a dozen mamme figs which had been taken from the tree about the middle of December. These figs were carried to San Francisco in a paper bag and, on the 8th of April, were put into a fruit jar in order to prevent drying out. On the 13th, female blastophaga commenced to issue, and continued to do so every morning, in a sunny window, for more than two weeks. On the 20th they came out in a great rush from 9 a. m. until 10.30. The issue gradually decreased until the 29th, when the largest of the figs was cut open and was found to still contain some females that would have come out later. This fig, the best developed one of the lot, yielded by actual count over 600 females and about 150 males. This certainly is a remarkable demonstration of the efficacy of the plan.

Mr. Markarian's method is simplicity itself. The best developed and most perfect figs are taken from the tree in December before the advent of heavy frosts. They are then packed in a box of clean damp sand. First an inch of sand then a layer of figs, being particular not

to let them touch each other or the side of the box, then another inch of sand, pressed down so as to completely envelop the figs, and so in alternate layers of sand and figs until the box is full. Top off with a final layer of sand and cover to prevent evaporation. The box, containing a thousand figs, was kept in a cellar where the temperature was about 55° to 60°. A few which had been frosted during the November freeze had molded, but all sound ones kept perfectly. In due season the figs were hung in his capri trees, and mature blastophaga came out as usual and entered the profichi crop. A surplus of figs was disposed of to neighbors and gave satisfaction.

By this plan the Smyrna fig growers can bid defiance to frost, and the mamme crop can be carried through winters in regions where the cold is too severe to render the growing of Smyrna figs otherwise practicable. In this way all trouble from loss of the winter crop in California and Arizona is obviated and may be the means of making it possible to grow the Smyrna fig all along the Gulf region of the Southern States from Florida to Texas. Another advantage of this plan is that the time of issue of the blastophaga can be regulated by changing the temperature of the storage room. If early insects are wanted, raise the temperature; if a later issue is desired, put the box in a little cooler place.

## HEATING THE ATMOSPHERE.

By ALEXANDER G. McADIE.

Sitting by an open fire, watching the coals burn, the thought may come that we are, indeed, burning ancient starshine. For the sun is of course a star, and, fortunately for our personal comfort, the only one near enough to present a face for study. The next nearest sun is 300,000 times as far away, or, in astronomical units, four light years distant. Therefore, we need not concern ourselves much about the amount of stellar energy other than solar intercepted by the earth and stored as fuel.

Now, the solar radiation does not fall directly upon the earth's surface, which, as will appear later, is also most fortunate for us; but falls upon a thin gaseous envelope and passes through this to the earth. Some of the solar energy is absorbed by the atmosphere, and for different rays the atmosphere has different coefficients of absorption. Some of the energy is reflected back into space. In fact, the albedo or proportion of reflection may be as much as 33 per cent. And, finally, some of the energy, especially some of the short waves, may undergo transformation in the higher levels, possibly through ionization. The chief absorbing medium in the lower air is water vapor, particularly effective with the long waves.

Abbot, Fowle, and Aldrich, in various reports of the work carried on at the astrophysical observatory, have fixed the average value of the solar constant of radiation at 1.925 calories per square centimeter per minute for the epoch 1905-1909. Higher values are to be expected during the sun spot minimum. For a sun spot cycle, 11.1 years, the average value may be taken as 1.95 calories.

In 1909 Abbot, using a spectroheliometer on the summit of Mount Whitney (14,502 feet), determined the energy distribution in the solar spectrum outside the atmosphere lying between wave lengths 0.29 $\mu$  in the ultra-violet and 3.0 $\mu$  in the infra-red.

The average temperature of the earth is 287° A. (absolute) and that of the upper atmosphere approximately 220° A. The apparent temperature of the sun, computed by various methods, ranges from 5,840° A. to 6,430° A.

If there were no atmosphere, the earth would receive heat during the day at a rapid rate and lose it rapidly during the night. Life in its present form would not be possible. But the atmosphere, and, as we shall see further on, the water vapor in particular, maintain conditions as we now know them.

In discussing the effect of the isothermal layer upon the temperature of the earth and lower atmosphere, Humphreys<sup>1</sup> shows that if this outer atmospheric shell lets in

<sup>1</sup> Bulletin Mount Weather Observatory, vol. 2, pt. 5, p. 288.